

CLAIMS

1. An image sensor comprising:

a sensor array that outputs data signals representing one or more images of a scene, wherein the sensor array is fabricated in an integrated circuit;

a memory space in communication with the sensor array and fabricated in the integrated circuit, the memory space partitioned into a data memory and a threshold memory, the data memory comprising memory cells for storing values representing the data signals; the threshold memory, in communication with the sensor array, for storing threshold values corresponding to each of the memory cells; and

an updating mechanism for updating the data memory for each of the one or more images; the update mechanism causing a group of the memory cells to be updated even though only a fractional number of the memory cells in the group need to be updated with new data signals.

2. The image sensor of Claim 1, wherein the updating mechanism comprises:

an identifying mechanism for identifying locations of the fractional number of the memory cells to be updated.

3. The image sensor of Claim 2, wherein the identifying mechanism includes one of (i) a row counter and (iii) a column counter.

4. The image sensor of Claim 2, wherein the group of memory cells is either a row of memory cells or a column of memory cells in the data memory.

5 5. The image sensor of Claim 2,
wherein the identifying mechanism includes the threshold memory space that includes a number of cells, each corresponding to one of the memory cells in the data memory space; and

10 wherein the fractional number of the memory cells are updated with the new data signals when threshold values in some of the corresponding cells in the threshold memory space permit such updating.

6. The image sensor of Claim 2, wherein the updating mechanism further comprises:

15 a read out mechanism for reading data out of the group of memory cells to a first buffer, wherein the first buffer is part of the memory space.

7. The image sensor of Claim 6, wherein the read out mechanism comprises:

20 a multiplexer having a select input, first and second data inputs, and a data output; the first data input coupled to the first buffer and the second data input coupled to a second buffer receiving the new data signals, contents of the threshold memory applied to the select input;

25 wherein the threshold memory controls the multiplexer to select which one of the first and second data inputs to pass to the data output; and

wherein the data output is coupled to the data memory and to update the group of memory cells therein.

8. The image sensor of Claim 7, wherein the multiplexer performs a multiplex operation expressed by the equation:

$$OUT = sel \bullet I_{NEW} + \overline{sel} \bullet I_{OLD}$$

where:

OUT = the data output of the multiplexer;

sel = a value output from the threshold memory;

I_{NEW} = a new data value from the second buffer; and

I_{OLD} = a data value from the data memory.

9. The image sensor of Claim 1, wherein, if the sensor array is of N by M pixels and has k-bits, the threshold memory is at least of N by M bits.

10. The image sensor of Claim 1, wherein the sensor array includes a plurality of pixel elements, each including a photodetector and an analog-to-digital conversation circuit, the photodetector generating an analog signal when the sensor array is exposed to the scene, the analog signal converted within the pixel element by the analog-to-digital conversation circuit to one of the data signals.

11. The image sensor of Claim 10, wherein the integrated circuit is fabricated by a CMOS process.

12. A method for updating a data memory in an image sensor, the method comprising operations of:

providing a sensor array that outputs signals representing one or more images of a scene, wherein the sensor array is fabricated in an integrated circuit;

5 providing a data memory, in communication with the sensor array, for storing values representative of the signals;

providing a threshold memory, in communication with the sensor array, for storing threshold values for each picture element of the one or more images of a scene;

10 wherein the data memory stores values for each picture element of the one or more images; and

providing an update mechanism for updating the data memory; wherein a memory update may be directed to only some of the locations in a row of the data memory.

15 13. The method of Claim 12, wherein the mechanism for updating step comprises:

identifying locations within a row of the data memory that are to be updated.

20 14. The method of Claim 13, wherein the identifying mechanism comprises the threshold memory, wherein those locations within a row of the data memory having a value that exceeds a predetermined threshold are to be updated.

25 15. The method of Claim 12, wherein the providing a mechanism for updating step comprises:

reading data out of a row of the data memory.

16. The method of Claim 15, wherein the providing a mechanism for updating step comprises:

5 providing a first buffer or other short term storage area within the image sensor for storing the data read out of a row of the data memory.

17. The method of Claim 16, wherein the providing a mechanism for updating step comprises:

10 providing a second buffer or other short term storage area within the image sensor for storing new data to be written from the sensor array to the data memory.

18. The method of Claim 17, wherein the providing a mechanism for updating step comprises:

15 providing a multiplexer having a select input, first and second data inputs, and a data output;

applying contents of the threshold memory to the select input; applied contents of the first and second buffers each to a different one of the first and the second data inputs of the multiplexer;

20 controlling with the threshold memory the multiplexer to select the new data from the second buffer if the predetermined threshold is exceeded;

controlling with the threshold memory the multiplexer to select the data read out of a row of the data memory data from the second buffer if
25 the predetermined threshold is not exceeded; and

providing a data output of the multiplexer which comprises an updated row of memory in which only values in those locations in the row that are to be updated have been changed.

5 19. The method of Claim 18, further comprising:

writing the data output of the multiplexer directly back to the data memory; wherein a next row of memory may then be updated.

10 20. The method of Claim 18, wherein the multiplexer operates a multiplex operation expressed by the equation:

$$OUT = sel \bullet I_{NEW} + \overline{sel} \bullet I_{OLD}$$

where:

OUT = the data output of the multiplexer;

sel = a value output from the threshold memory;

15 I_{NEW} = a new data value from the second buffer; and

I_{OLD} = a data value from the data memory.

21. The method of Claim 12, wherein the sensor array is of N by M pixels and has k-bits.

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22. The method of Claim 12, wherein the threshold memory is of N by M bits.

23. The method of Claim 12, further comprising:

25 providing the threshold memory for preventing read out of unnecessary values to the data memory.

24. In an image sensor comprising a sensor array that outputs signals representing one or more images of a scene, wherein the sensor array is fabricated in an integrated circuit; a data memory, in communication with the sensor array, for storing values representative of the signals, and a threshold memory, in communication with the sensor array, for storing threshold values for each picture element of the one or more images of a scene, an apparatus comprising:

a multiplexer having a select input, first and second data inputs, and a data output;

wherein contents of the threshold memory are applied to the select input;

wherein contents of a first and a second buffer are each applied to a different one of the first and the second data inputs of the multiplexer; wherein the threshold memory controls the multiplexer to select the new data from the second buffer if the predetermined threshold permits;

wherein the threshold memory controls the multiplexer to select the data read out of a row of the data memory data from the second buffer if the predetermined threshold does not permit; and

the data output of the multiplexer comprises an updated row of memory in which only values in those locations in the row that are to be updated have been changed.

25. The image sensor of Claim 24, wherein the apparatus comprises:

an identifying mechanism for identifying locations within a row of the data memory that are to be updated.

26. The image sensor of Claim 25, wherein the identifying mechanism comprises the threshold memory, wherein those locations within a row of the data memory having a value that exceeds a predetermined threshold are to be updated.

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27. The image sensor of Claim 25, wherein the apparatus comprises: a read out mechanism for reading data out of a row of the data memory.

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28. The image sensor of Claim 27, wherein the data output of the multiplexer is written directly back to the data memory and a next row of memory may then be updated.

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29. The image sensor of Claim 27, wherein the multiplex operation is expressed by the equation:

$$OUT = sel \bullet I_{NEW} + \overline{sel} \bullet I_{OLD}$$

where:

OUT = the data output of the multiplexer;

sel = a value output from the threshold memory;

I_{NEW} = a new data value from the second buffer; and

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I_{OLD} = a data value from the data memory.

30. The image sensor of Claim 24, wherein the image sensor is implemented as a CMOS image sensor.